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EXAMINER	
CHERY, DADY	

ART UNIT	PAPER NUMBER
2461	

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12/23/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/538,947	SPENCE ET AL.	
	Examiner	Art Unit	
	DADY CHERY	2461	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09/10/2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5,6 and 10-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5,6,10-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

This is in response to an amendment/response filed on September 10th, 2009.

Claims1, 3, 5, 6, 11, 12, 14, 15, 16-19 and 21 have been amended.

Claims 4 and 7 -9 have been cancelled.

No Claims have been added.

Claims 1-3, 5- 8 and 10 - 21 are currently pending.

Response to Arguments

Applicant's arguments filed September 10th, 2009 have been fully considered but they are not persuasive.

Claims 1, 14, 16

The applicant argues that Stetson fails to disclose "obtain at least one of estimated separated signal modulation envelopes and estimated separated signal cyclets". The examiner respectfully disagrees with the applicant because Stetson discloses an independent component analysis ICA method for decomposition of a matrix component of a composite source signal by using decorrelation as disclosed by the instant application **(Col. 7, lines 32 -41).** As define by the instant application the base unit is the smallest repeating unit within the signal and it will be referred to herein as a "cyclet". The decomposition signals disclosed by Stetson are also considered as the base unit of the source signal **(See Fig. 3 – Fig. 6).**

Claim 2

Regarding the applicant's argument for claim 2, Stetson discloses a source signal s (t) which is periodic signal **(see fig. 3)** where the sum of probability $p(s) = \prod_{i=1}^{m} pi(si)$ is considered as the averaging of the composite signal**(see Col. 5, lines 30 -35).**

Claims 3, 5,6,13

The applicant's argues that Stetson does not disclose obtaining estimated separated signal modulation envelopes or estimated separated signal. The examiner respectfully disagrees because Stetson discloses an independent component analysis (ICA) and a principal component analysis (PCA) method for decomposition of the source signal by using a singular value decomposition SVD with a mixture matrix where the mixture matrix included the signal modulation and the cyclets**(Col. 6, lines 64 – 67 and Col. 7, lines 32 -67, this is the same function as the instant application).**

Claim 10

In response to applicant's argument regarding claim 10 that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., photodetector) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Furthermore, item 110 of fig. 1 of Stetson clearly mention sensor.

Claims 11, 12

The applicant argues that Stetson discloses all sensor signals combine into one matrix for processing. The examiner respectfully disagrees with the applicant characterization of Stetson because Stetson discloses all sensor signals are combined into of set of matrix such $X_1(t)$.... x_n (t) **(See Col. 5, lines 20 – 30).**

Claims 15 and 17

The applicant argues that Stetson fails to disclose "obtain at least one of estimated separated signal modulation envelopes and estimated separated signal cyclets". The examiner respectfully disagrees with the applicant because Stetson discloses an independent component analysis ICA method for decomposition of a matrix component of a composite source signal by using decorrelation as disclosed by the instant application **(Col. 7, lines 32 -41).** As define by the instant application the base unit is the smallest repeating unit within the signal and it will be referred to herein as a "cyclet". The decomposition signals disclosed by Stetson are also considered as the base unit of the source signal **(See Fig. 3 – Fig. 6).** Stetson discloses a source signal s (t) which is periodic signal **(see fig. 3).** Furthermore, Stetson discloses an independent component analysis ICA method for decomposition of a matrix component of a composite source signal by using decorrelation as disclosed by the instant application **(Col. 7, lines 32 -41).** As define by the instant application the base unit is the smallest repeating unit within the signal and it will be referred to herein as a "cyclet". The decomposition signals disclosed by Stetson are also considered as the base unit of the source signal **(See Fig. 3 – Fig. 6).**

Claims 18 -21

In response to applicant's arguments, the recitation "each source signal having a respective period similar or equal to p" has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

The applicant argues that Lee fails to discloses expressing the composite signal as a trial matrix having rows of which is a respective segment of signal amplitude values and correspond to a length of time with a signal cyclet with a trial period. The examiner respectfully disagrees with the applicant characterization of Lee because Lee discloses a series of observations (trials) vary from t=1 to t=T where t is the length time associated with a signal cyclet and the signal by nature is periodic signal as disclosed by the instant application. The observed signal is expressed as matrix x(t) **(Fig. 1, 140 and Col. 5, lines 21 -35).**

For at least the reasons provided above, the applicant's arguments regarding independent claim 1 are not persuasive. The applicant argues that independent claims 14 and 15-19 are patentable for similar reasons and are also not persuasive. The further argues that since dependent claims 2-6, 10—13 and 20 -21 depend on the argued independent claims, they are patentable at least by virtue of their dependencies.

Since the applicant's arguments regarding dependent claims 2-6, 10—13 and 20 -21 are also not persuasive.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-3, 5, 6 and 10 -17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stetson in view of Lee.

Regarding claims 1, 14 and 16, Stetson discloses a method and computer apparatus for separating a plurality of source signals from a composite signal expressed as a series of values of signal amplitude, each source signal having a respective period similar or equal to p, the method comprising the steps **(Fig. 1 and Fig. 3)** of:

(a) expressing the composite signal as a matrix X having rows each of which is a respective segment of signal amplitude values and corresponds to a length of time associated with a signal cyclet **(Col. 5, lines 20 – 26);**

(b) implementing a decomposition of the matrix X by decorrelation and normalisation to obtain decomposition results **(Col. 6, lines 64 – 67);**

(c) performing independent component analysis (ICA) of the decomposition results to obtain at least one of estimated separated signal modulation envelopes and estimated separated signal cyclets **(Col. 7, lines 32 -67).**

Stetson discloses a composite signal as a matrix having rows x (t), having an amplitude value as a signal, which is a function of time but, Stetson does not explicitly discloses these value corresponds to a length of time associated with a signal cyclet.

However, Lee teaches a matrix having rows x (t) having values correspond to a length of time with signal cyclet **(Fig. 1, Col. 4, lines 58 – 67).**

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method and computer apparatus discloses by Stetson with Lee for the purpose of giving an estimate of the number of actual sources in data **(Col. 4, lines 58 – 67).**

Regarding claim 2, Stetson discloses a method according to claim 1 including the step of estimating source signal period p by synchronous averaging of the composite signal **(Col. 5, lines 30 -35).**

Regarding claim 3, Stetson discloses a method according to claim 1 wherein the decomposition is a singular value decomposition generating decomposition results comprising two singular vector matrices and a singular value matrix, and the step of performing ICA is carried out using one of the singular vector matrices to obtain at least one of an independent component matrix and an associated component matrix one of which matrices contains estimated separated signal modulation envelopes and the other contains estimated separated cyclets **(Col. 6, lines 64 – 67 and Col. 7, lines 32 - 67) .**

Regarding claim 5, Stetson discloses a method according to claim 3 wherein the signal modulation envelopes are more statistically independent than the cyclets and step (c) is performed on a singular vector matrix U to obtain an independent component matrix UR.sub.2.sup.T containing estimated separated signal envelopes and a matrix R.sub.2.lamda.V containing estimated separated cyclets **(Col. 7, lines 32 -67).**

Regarding claim 6, Stetson discloses a method according to claim 3 wherein the cyclets are more statistically independent than the signal envelopes and step (c) is performed on a singular vector matrix V to obtain an independent component matrix R.sub.1.sup.TV containing estimated separated cyclets and a matrix U.lamda.R.sub.1 containing estimated separated signal envelopes **(Col. 7, lines 32 -67).**.

Regarding claim 10, Stetson discloses a method according to claim 1 wherein the composite signal is detected by a single sensor **(Fig. 1, 110).**

Regarding claim 11, Stetson discloses a method according to claim 1 including detecting the source signals are detected by using a plurality of sensors each of which provides a respective composite signal from which a respective matrix X is obtained and analyzed in steps (a) to (c) **(Col. 1, lines 64 -67, Col. 5, lines 20 – 26 and Col. 6, lines 64 – 67)**.

Regarding claim 12, Stetson discloses a method according to claim 1 including detecting the source signals are detected by using a plurality of sensors providing respective composite signals, and the matrix X is obtained from the composite signals collectively **(Col. 1, lines 64 -67, Col. 5, lines 20 – 26 and Col. 6, lines 64 – 67)**.

Regarding claim 13, Stetson discloses a method according to claim 1 for apparatus condition monitoring, the source signals being obtained with the aid of at least one sensor from a plurality of apparatus sources, and the at least one of estimated separated signal modulation envelopes and estimated separated signal cyclets being

analyzed for indications as to the condition of respective apparatus sources **(Fig. 1, Col. 4, lines 33 -60).**

Regarding claims 15 and 17, Stetson discloses a computer apparatus (**Fig. 1)** arranged to separate for separating a plurality of source signals from a composite signal expressed as a series of values of signal amplitude, the source signals having periodicities similar or equal to p**(Fig. 3),** characterised in that and the computer apparatus being programmed **(Col. 6, lines 45 – 50)** to:

(a) partition the composite signal into a plurality of partition matrices X having rows each of which is a respective segment of signal amplitude values and corresponds to a length of time associated with a signal cyclet **(Col. 5, lines 20 – 26);**

(b) perform a singular value decomposition (SVD) of at least one of the matrices X to obtain two singular vector matrices U, V and a singular value matrix .lamda **(Col. 6, lines 64 – 67) .;**

(c) estimate a true period p of the source signals from an average of data within rows of the partition matrices X **(Col. 5, lines 30 -35);** and

(d) perform an independent component analysis of one of the singular vector matrices U, V generated by SVD from the matrix X partitioned in accordance with the estimated period p and so to obtain an independent component matrix UR.sub.2.sup.T, R.sub.1.sup.TV and an associated component matrix R.sub.2.lamda.V, U.lamda.R.sub.1, one component matrix UR.sub.2.sup.T, U.lamda.R.sub.1 containing

estimated separated signal modulation envelopes and the other R.sub.2.lamda.V, R.sub.1.sup.TV contains containing estimated separated cyclets **(Col. 7, lines 32 -67).**

Stetson discloses a composite signal as a matrix having rows x (t), having an amplitude value as a signal, which is a function of time but, Stetson does not explicitly discloses these value corresponds to a length of time associated with a signal cyclet.

However, Lee teaches a matrix having rows x (t) having values correspond to a length of time with signal cyclet **(Fig. 1, Col. 4, lines 58 – 67).**

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method and computer apparatus discloses by Stetson with Lee for the purpose of giving an estimate of the number of actual sources in data **(Col. 4, lines 58 – 67).**

5. Claims 18 -21are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee in view of Stetson.

Regarding claim 18, Lee discloses a method **(fig. 1)** of separating a plurality of source signals **(121,122,102 etc)** from a composite **(101)** signal expressed as a series of values of signal amplitude, each source signal having a respective period similar or equal to p, the method comprising the steps of:

(a) expressing the composite signal as a trial matrix Xtest having rows each of which is a respective segment of signal amplitude values and corresponds to a length of time associated with a signal cyclet with a trial period p' **(Col. 4, lines 58 – Col. 5, lines 35, which recites a series of observations included a group data vectors from X1 to**

XT having amplitude and time length) ,

(c) iterating steps (a) and (b) to generate versions of the trial matrix Xtest for a series of different values of the trial period p'**(Col. 2, lines 20 -25, which describes an iteration process);**

(d) performing independent component analysis (ICA) upon results obtained in the singular value decomposition of that version of the trial matrix Xtest associated with maximum probability and having signal cyclet of trial period p' taken to be the period p subject to this period not corresponding to a multiple of a true period **(Col. 5, lines 47 - 67, which describes an ICA method performs on a series of observations) .**

Lee does not expressly disclose (b) implementing a singular value decomposition of the trial matrix Xtest to generate two singular vector matrices and a singular value matrix, each trial matrix Xtest having a probability associated with its decomposition.

However, Stetson teaches (b) implementing a singular value decomposition of the trial matrix Xtest to generate two singular vector matrices and a singular value matrix, each trial matrix Xtest having a probability associated with its decomposition **(Col. 6, lines 64 – Col. 7, lines 12).**

Therefore, It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teaching of Lee with the teaching of Stetson by using these features such as implementing a singular value decomposition of the trial matrix Xtest to generate two singular vector matrices and a singular value matrix, each trial matrix Xtest having a probability associated with its decomposition for the purpose

of minimizing a function of the higher-order cross-correlation of the data **(Col. 3, lines 28 -33).**

Regarding claim 19, Lee discloses a method **(fig. 1)** of separating a plurality of source signals **(121,122,102 etc)** from a composite signal **(101)** expressed as a series of values of signal amplitude, each source signal having a respective period similar or equal to p, the method comprising the steps of:

(a) expressing the composite signal as a matrix X having rows each of which is a respective segment of signal amplitude values and corresponds to a length of time associated with a signal cyclet **(Col. 4, lines 58 – Col. 5, lines 35, which recites a series of observations included a group data vectors from X1 to XT having amplitude and time length) ,**

(c) estimating a number q of source signals with periodicities similar or equal to p present within the composite signal and reducing the decomposition results in accordance with such number**(Col. 4, lines 58 -67, which recites it may be useful to estimate the number of source);** and

(d) performing independent component analysis (ICA) of the decomposition results to obtain at least one of estimated separated signal modulation envelopes and estimated separated signal cyclets**(Col. 5, lines 47 -67, which describes an ICA method performs on a series of observations) .**

Lee does not expressly disclose (b) implementing a decomposition of the matrix X by decorrelation and normalisation to obtain decomposition results;

However, Stetson teaches (b) implementing a decomposition of the matrix X by decorrelation and normalisation to obtain decomposition results **(Col. 6, lines 64 -67).**

Therefore, It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teaching of Lee with the teaching of Stetson by using these features such as implementing a decomposition of the matrix X by decorrelation and normalisation to obtain decomposition results for the purpose of minimizing a function of the higher-order cross-correlation of the data **(Col. 3, lines 28 - 33).**

Regarding claim 20, Lee discloses the method according to Claim 19 characterised in that the number q of source signals is estimated from the source signals' origins **(Col. 4, lines 58 -67)**.

Regarding claim 21, Lee discloses a method according to Claim 19 characterised in that the number q of source signals is estimated from a number of elements of a singular value matrix λ, the elements having values exceeding a threshold value **(Col. 13, lines 30 -39).**

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DADY CHERY whose telephone number is (571)270-1207. The examiner can normally be reached on Monday - Thursday 8 am - 4 pm ESt.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy D. VU can be reached on 571-272-3155. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Dady Chery/
Examiner, Art Unit 2461

/Jason E Mattis/
Primary Examiner, Art Unit 2461